A Comparison of Post-traumatic Growth After Acquired Brain Injury or Myocardial Infarction

Olga Karagiorgou and Breda Cullen

University of Glasgow

Author Note

Olga Karagiorgou, School of Psychology, University of Glasgow, Glasgow, UK.

Breda Cullen, Mental Health and Wellbeing, Institute of Health and Wellbeing, University of Glasgow, Glasgow, UK.

Olga Karagiorgou is now at Mental Health and Wellbeing, Institute of Health and Wellbeing, University of Glasgow, Glasgow, UK.

This manuscript is based on a dissertation submitted by Olga Karagiorgou to the University of Glasgow for the award of Master of Science. Breda Cullen is supported by The Dr Mortimer and Theresa Sackler Foundation.

Correspondence regarding this article should be addressed to Dr Breda Cullen, University of Glasgow, Office Block, Queen Elizabeth University Hospital, Glasgow G51 4TF, UK. Email breda.cullen@glasgow.ac.uk

Abstract

Post-traumatic growth (PTG) is known to occur following acquired brain injury (ABI). It is not yet known to what extent PTG experiences following ABI are unique to the neurological nature of the injury. We investigated PTG in survivors of ABI or myocardial infarction (MI); MI is comparable to ABI but does not have a primary neurological element. Thirty-three ABI survivors (age *M*=51.6, *SD*=12.4; 52% male; years since injury *M*=5.5, *SD*=5.3) and 47 MI survivors (age *M*=66.4, *SD*=9.9; 79% male, years since injury *M*=9.9, *SD*=8.6) completed a survey including the Posttraumatic Growth Inventory (PTGI). Unadjusted analyses showed no significant group differences on PTGI total score (ABI *M*=54.0, *SD*=19.6; MI *M*=54.6, *SD*=23.6; *d*=.03, *p*=.902) or on any of the five subscales, but analyses adjusted for covariates showed that scores on 'Relating to others' were higher in participants with ABI (unstandardized coefficient=5.43; 95% CI .27, 10.60; *p*=.039). Open-ended comments revealed aspects of growth in both samples that were not directly captured by the five PTGI factors.

Keywords: Post-traumatic growth; physical illness; acquired brain injury; myocardial infarction

A Comparison of Post-traumatic Growth After Acquired Brain Injury or Myocardial Infarction

Acquired brain injury (ABI)—resulting from head injury, stroke, haemorrhage, infection, tumour or other causes—can lead to a range of difficulties in physical, cognitive, emotional and behavioural functioning, which may be highly distressing and disabling. On the other hand, ABI is a major life experience from which people may have the opportunity to grow psychologically and reconsider their values, beliefs and behaviour, thereby fostering post-traumatic growth (PTG). Post-traumatic growth is defined as a "positive psychological change experienced as the result of the struggle with highly challenging life circumstances" (Tedeschi & Calhoun, 2004).

A recent systematic review (Grace, Kinsella, Muldoon, & Fortune, 2015) included eight quantitative studies of PTG following ABI in adults, the first of which was conducted only nine years ago (Collicutt McGrath & Linley, 2006). Most of the studies used the Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996). Higher levels of PTG were associated with longer duration since injury, higher premorbid education, older age, being in employment, being in a relationship, and lower levels of depression.

To date, there has been no empirical study of PTG that has compared ABI directly with other medical conditions. This means that it is not yet known how PTG in ABI survivors may be related specifically to the neurological nature of their injury, or more generally to illness/injury experiences that are shared with other patients. A large proportion of ABI survivors experience cognitive impairment, and many must also contend with sensory and motor disability. The effects on independent functioning are sudden and may be catastrophic: many survivors are unable to resume their pre-injury roles within family, workplace and community. Although this is also true of people with other severe illnesses and injuries, the combination of cognitive impairment and instrumental disability following a sudden life-

threatening event is unique to ABI. It is therefore important to understand whether aspects of PTG may also be different in ABI survivors compared to patient groups who are similar in some respects but who do not experience the particular combination of impairment and disability that is the hallmark of ABI.

Myocardial infarction (MI)—or heart attack—is one medical condition with which appropriate comparison may be made. ABI and MI represent two common and serious medical events, the onset of which is typically unexpected, sudden and potentially life-threatening, and which usually necessitate hospital treatment and subsequent rehabilitation. Additionally, ABI and MI are associated with adverse psychological consequences, such as depression and anxiety. However, they differ in an important respect, which is that brain injury affects neurological functions (e.g. cognition, sensation, movement), whereas MI typically does not. This may lead to different PTG experiences in these patient groups. It is possible that impairment of cognition, insight and awareness in some ABI survivors, and consequential effects on cognitive appraisal and perspective-taking, may influence the dynamic cognitive processes that underpin PTG development, such as those outlined by Linley and Joseph (2004). Presence of cognitive impairment may also be a barrier to availing of new opportunities (e.g. adapting successfully to work or social role changes), thereby narrowing the scope for positive life experiences that foster PTG. Furthermore, reduced awareness or insight may affect patterns of responding on self-report instruments such as the PTGI.

The first objective of this research was to investigate whether the PTGI questionnaire differentiates PTG experiences between an ABI sample and an appropriate comparison group (MI). Given the dearth of previous similar research, we did not make strong predictions about magnitude and direction of group differences on the PTGI. It might tentatively be expected, however, that the ABI group would show relatively lower scores on the PTGI factor of ‘New

Possibilities', in light of the barriers noted above. Our second objective was to ascertain whether there are additional aspects of PTG (in either sample) that are not captured by the PTGI's five factors. Seven of eight previous studies on PTG following ABI have used the PTGI (Grace *et al.*, 2015), meaning that the literature is biased towards the growth factors that are covered by this instrument. We wished to explore whether additional feedback from participants would point to other aspects of growth that should be measured in future studies.

Method

Participants

The primary sample comprised adults with ABI. They were recruited from Headway, the UK Brain Injury Association, through its website, social media and local support groups. Adults who had survived an MI were included as a comparison group, and were recruited via support groups affiliated with the charities Chest Heart and Stroke Scotland and the British Heart Foundation. Participants (men or women) were required to be 18 years old or over, with age at injury (ABI or MI) being at least 17 years.

Of 43 ABI survivors who responded to the study invitation, 10 were excluded (3 had ABI in childhood; 1 responded on behalf of a relative with ABI; 6 did not complete the PTGI). Of 57 respondents to the MI group invitation, 10 were excluded (8 had non-MI cardiac events; 2 did not complete the PTGI). Therefore 33 participants with ABI and 47 participants with MI were included in the analysis. Participants who had both an ABI and MI were classified according to the most recent incident. Among the ABI sample, the most common type of injury was a head injury (N = 10, 30.3%), followed by haemorrhage (N = 9, 27.3%), stroke (N = 7, 21.2%), tumour (N = 3, 9.1%), and other/more than one type (N = 4, 12.1%).

Characteristics of the samples are presented in Table 1. The ABI sample was significantly younger than the MI sample, M difference = -14.8 (95% CI -19.8, -9.8), d =

1.33. There was a greater proportion of men in the MI group (r = .7). A greater proportion of the MI group were in a relationship (r = .8), and had children (r = .6). Time since injury (years) was shorter for the ABI group, *M* difference = -4.4 (bootstrapped 95% CI -7.6, -1.3), d = .66. The groups differed regarding overall health ratings (r = .5), with the ABI group currently feeling 'a bit worse' compared to before their injury and the MI group currently feeling 'a bit better'. There were no significant group differences in education level or in proportions currently working.

Materials

Demographic and background information. Information was collected on age, gender, current employment status, education level, current relationship status, type of injury, duration since injury, and perceived current overall health status compared to before the injury (0 = a lot worse, 1 = a bit worse, 2 = about the same, 3 = a bit better and 4 = a lot better).

Posttraumatic Growth Inventory (PTGI). The PTGI (Tedeschi & Calhoun, 1996) is a self-report scale that was designed to measure positive growth following traumatic events. It measures five factors: 'Relating to others', 'New possibilities', 'Personal strength', 'Spiritual change', and 'Appreciation of life'. There are 21 items scored on a six-point Likert scale, between 0 ('I did not experience this change as a result of my crisis') and 5 ('I experienced this change to a very great degree as a result of my crisis'). Tedeschi and Calhoun (1996) reported that the internal consistency of the PTGI total scale was good (Cronbach's alpha = 0.90), and one study with ABI survivors also reported a high alpha coefficient of 0.93 (Rogan, Fortune, & Prentice, 2013). In the present study, alpha was 0.90 in the ABI sample and 0.96 in the MI sample.

Procedure

Participants completed the survey either online through the SurveyMonkey website or in writing; printed copies were supplied to groups and individuals and then returned anonymously by mail. No payment was offered to participants, but participation time was kept to a minimum to reduce burden.

After having read the information sheet and given their consent to take part, participants anonymously answered demographic and background questions, followed by the PTGI. At the end, participants were asked to give further open-ended comments about the topic of personal growth post-injury, if they wished. In line with our second study objective, this item was fully open-ended to allow us to pick up aspects of growth that have not been assessed in the literature to date.

Ethical approval was obtained from the Research Ethics Committee of the College of Medical, Veterinary and Life Sciences at the University of Glasgow (reference 200130071). Because the responses were anonymous, it was not possible to directly ensure that all participants had capacity to consent to research. However, the fact that a participant had successfully accessed and completed the survey was taken as indirect evidence of capacity.

Data Analysis

Since there were no studies to date that had compared ABI survivors with similar medical groups, it was not known how large the difference in scores between these groups might be, which therefore limited the ability to perform an *a priori* sample size calculation. G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007) calculates that if a *t*-test was performed to compare PTGI scores between the two groups, with .80 power and alpha = .05, $N = 64$ would be required in each group to detect a significant difference of medium (or larger) effect size (Cohen's $d = 0.5$ or above). This equates to a difference of approximately 11 points on the PTGI total score, based on score variation reported in one recent study (Rogan et al., 2013). Similarly, $N = 26$ would be required in each group to detect a significant

difference of large effect size (Cohen's d = 0.8 or above, or a difference of approximately 18 points on the PTGI total score). Our sample size of 33 participants with ABI and 47 participants with MI is therefore sufficient to detect a significant group difference of large effect, but significance tests for small to medium effect sizes would be underpowered.

Since there were missing values on some variables, analyses were first carried out using all available data (N differed across variables), and then a complete case analysis (restricted only to participants with no missing data) was conducted for the purpose of comparison. Because the results of these were similar, the results using all the available data are reported below. Data were analysed using the Statistical Package for the Social Sciences (SPSS) for Windows, Version 20. Demographic and clinical information was summarised descriptively for each group using percentages and measures of central tendency and dispersion. Normality was checked with Shapiro-Wilk tests. Group differences were tested using t-tests (with 1000-samples bootstrapping for non-normally distributed variables), Mann-Whitney U-tests or χ^2 tests, depending on the nature and distribution of the data. Exploratory multiple linear regression models (with 1000-samples bootstrapping for non-normally distributed dependent variables) were carried out to investigate PTGI score differences with adjustment for other variables. Results are reported with two-tailed p-values, and standard errors (SE) or 95% confidence intervals (CI) where available; the significance level was 0.05; and standardized effect sizes are reported as Cohen's d, correlation coefficient r or regression coefficient β. Thematic analysis was used to code open-ended comments, with reference to the five factors of the PTGI.

Results

Posttraumatic Growth Inventory

PTGI scores are presented in Table 2. Unadjusted analyses showed no significant differences between ABI and MI groups on the PTGI total score (d = .03), nor on any of the

sub-scales: ‘Relating to others’ (d = .16); ‘New possibilities’ (d = .22); ‘Personal strength’ (d = .15); ‘Spiritual change’ (d = .08); ‘Appreciation of life’ (d < .01). Multiple linear regression models in the combined samples were used to explore the extent to which group membership (ABI vs MI) and other key characteristics that differed between the groups (age, gender, being in a relationship, time since injury, and perceived overall health) were associated with PTGI scores (see Table 3). Only the ‘Relating to others’ score was significantly associated with group membership, such that participants with ABI had higher scores after adjustment for the other variables (unstandardized coefficient = 5.43; 95% CI .27, 10.60; p = .039). Of the other model variables, longer time since injury was significantly associated with higher PTGI total (unstandardized coefficient = .71; 95% CI .03, 1.40; p = .042) and ‘New possibilities’ (unstandardized coefficient = .27; 95% CI .07, .46; p = .009), and being in a relationship was significantly associated with higher scores on ‘Relating to others’ (unstandardized coefficient = 9.34; 95% CI 3.68, 15.01; p = .002).

Open-ended Comments About Personal Growth

The optional question was answered by 50 participants; 17 (34.0%) belonged to the ABI sample and 33 (66.0%) to the MI sample. Six themes were shared by ABI and MI samples, of which four corresponded to PTGI factors: ‘Relating to others’ (ABI N = 8, MI N = 11), ‘New possibilities’ (ABI N = 2, MI N = 13), ‘Personal strength’ (ABI N = 6, MI N = 6), ‘Appreciation of life’ (ABI N = 3, MI N = 3); and two were new themes: ‘Optimism/Positive attitude’ (ABI N = 2, MI N = 3) and ‘Emotional/Behavioural changes’ (ABI N = 2, MI N = 2). One further new theme was expressed only by the MI sample: ‘Lifestyle improvements’ (MI N = 9). Illustrative quotes are given in the Appendix.

Discussion

No differences in PTGI scores were detected between ABI survivors and MI survivors in the unadjusted analyses. Since the two groups differed significantly in their demographic

characteristics, time since injury, and perceived health status, these variables were considered along with group membership in multivariate regression models. Following adjustment, it was found that participants with ABI had higher scores on the 'Relating to others' factor of the PTGI, but other group differences remained non-significant.

The possibility that an increase in 'Relating to others' distinguishes ABI survivors from the comparison group requires replication, ideally with samples that are matched by demographic and clinical characteristics. Being in a relationship was also strongly associated with 'Relating to others' scores in our analyses. It would be important to investigate whether there is an interaction between injury type and relationship status in predicting PTG: it is possible that the association between relationship status and PTG operates differently in people with ABI compared to those with MI, e.g. the beneficial contribution of a relationship to the development of PTG may be amplified in ABI. We were unable to evaluate this in the present study owing to insufficient numbers of MI survivors who were not in a relationship, but this should be further investigated in future studies.

The modest sample size reduced statistical power to detect group differences on the other PTGI scores, but the score distributions indicated that any true difference in the population is likely to be small. This may imply that experiences of PTG are very similar across these medical groups, or that the PTGI questionnaire is insufficiently sensitive to idiosyncratic aspects of growth. The latter possibility is supported by the finding that participants in both groups reported additional growth experiences that were not directly captured by the PTGI. Furthermore, one theme ('Lifestyle improvements') was only expressed by the MI sample, and future research with this population should explore this in more detail.

To our knowledge, this is the first study of post-traumatic growth following ABI to include a medical control group, and is further strengthened by the inclusion of both

quantitative and qualitative data. The study has a number of limitations, however, including the modest sample size, and the various background differences between the two samples. The anonymous survey format limited the clinical information that could be obtained; additional data regarding factors such as previous rehabilitation and psychological therapy input would have enriched the study. Cognitive functioning is a further consideration, as this may have influenced response reliability and/or ability to articulate experiences in the open-ended section. As outlined in the introduction, cognitive impairment and reduced awareness could potentially influence opportunities for growth-promoting life experiences as well as influencing perceptions of change, and these should be directly assessed in future research in this field.

Future studies would also benefit from measuring post-traumatic growth using other types of instruments, such as the Psychological Well-Being - Post-Traumatic Changes Questionnaire (Joseph et al., 2012), which aims to evaluate perceived negative as well as positive changes in psychological wellbeing following trauma. This would facilitate a more comprehensive assessment of growth and its evolution over time, which in turn could inform rehabilitation approaches aimed at fostering PTG and psychological wellbeing post-injury.

References

Collicutt McGrath, J., & Linley, P. A. (2006). Post-traumatic growth in acquired brain injury: A preliminary small scale study. *Brain Injury, 20*(7), 767–773. doi: 10.1080/02699050600664566

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191. doi: 10.3758/BF03193146

Grace, J. J., Kinsella, E. L., Muldoon, O. T., & Fortune, D. G. (2015). Post-traumatic growth following acquired brain injury: a systematic review and meta-analysis. *Frontiers in Psychology, 6*, 1162. doi: 10.3389/fpsyg.2015.01162

Joseph, S., Maltby, J., Wood, A. M., Stockton, H., Hunt, N., & Regel, S. (2012). The Psychological Well-Being - Post-Traumatic Changes Questionnaire (PWB-PTCQ): Reliability and Validity. *Psychological Trauma: Theory, Research, Practice, and Policy, 4*(4), 420-428. doi: 10.1037/a0024740

Linley, P. A., & Joseph, S. (2004). Positive Change Following Trauma and Adversity: A Review. *Journal of Traumatic Stress, 17*(1), 11-21. doi: 10.1023/B:JOTS.0000014671.27856.7e

Rogan, C., Fortune, D. G., & Prentice, G. (2013). Post-Traumatic Growth, Illness Perceptions and Coping in People with Acquired Brain Injury. *Neuropsychological Rehabilitation, 23*(5):639-657. doi: 10.1080/09602011.2013.799076

Tedeschi, R. G.., & Calhoun, L. G.. (1996). The Posttraumatic Growth Inventory: Measuring the Positive Legacy of Trauma. *Journal of Traumatic Stress, 9*(3), 455-471. doi: 10.1002/jts.2490090305

Tedeschi, R. G.., & Calhoun, L. G.. (2004). Posttraumatic growth: Conceptual foundations and empirical evidence. *Psychological Inquiry, 15*, 1–18. doi:

10.1207/s15327965pli1501_01

Table 1

Sample Characteristics

	ABI group $N = 33$		MI group $N = 47$		Test (df)	Test statistic	*p*
	N	%	*N*	%			
Gender					$\chi^2(1, N = 80)$	6.5	.015
Male	17	51.5	37	78.7			
Female	16	48.5	10	21.3			
In a relationship					$\chi^2(1, N = 80)$	7.1	.013
Yes	25	75.8	45	95.7			
No	8	24.2	2	4.3			
If not in a relationship					-	-	-
Never been in a relationship	4	12.1					
Separated/Divorced	2	6.1	1	2.1			
Widowed	1	3.0	1	2.1			

Has children											$\chi^2(1, N = 80)$	4.9	.05
Yes	22	66.7				41	87.2						
No	11	33.3				6	12.8						
Education											$U = 722.5$	$z = -.14$	.890
No qualifications	2	6.1				5	10.6						
Some high school	8	24.2				7	14.9						
Completed high school	2	6.1				2	4.3						
Some college	10	30.3				19	40.4						
Undergraduate degree	3	9.1				8	17.0						
Postgraduate degree	7	21.2				5	10.6						
Currently working											$\chi^2(1, N = 74)$	.01	1.00
Yes	9	27.3				12	25.5						
No	22	66.7				31	66.0						
	N	*M*	*SD*	*Mdn*	*IQR*	*N*	*M*	*SD*	*Mdn*	*IQR*			
Age	33	51.6	12.4			47	66.4	9.9			*t*(78)	5.9	< .001
Years since injury	33			3.0	5.0	44			7.5	15.0	*t*(72.4)	2.8	.011

Overall health[a]	32	1.0	2.0	46	3.0	2.0	$U = 306.00$	$z = 4.5$	$< .001$

Note. ABI = acquired brain injury, MI = myocardial infarction. Missing data on some variables means that not all column entries correspond to the group totals given at the top.

[a] Health was rated in comparison to before the injury, with 0 = a lot worse, 1 = a bit worse, 2 = about the same, 3 = a bit better and 4 = a lot better.

Table 2

PTGI Scores in ABI and MI Groups

	ABI group $N = 33$			MI group $N = 47$			Test (df)	Test statistic	*p*	Mean difference (95% CI)
	N	*M*	*SD*	*N*	*M*	*SD*				
PTGI total score	33	54.0	19.6	47	54.6	23.6	*t*(78)	.12	.902	-.6 (-10.6, 9.3)
Relating to others	32	21.0	8.0	46	19.6	9.0	*t*(76)	.70	.486	1.4 (-2.6, 5.3)
New possibilities	32	10.7	6.0	46	12.1	6.4	*t*(76)	.98	.329	-1.4 (-4.3, 1.4)
Personal strength	32	9.9	4.8	46	10.6	4.8	*t*(76)	.66	.514	-.7 (-2.9, 1.5)
Spiritual change	33	2.6	3.2	46	2.8	3.4	*t*(77)	.36	.705	-.3 (-1.6, 1.3)[a]
Appreciation of life	33	10.4	3.6	46	10.4	5.1	*t*(77)	.02	.988	.02 (-1.9, 1.9)[a]

Note. ABI = acquired brain injury, CI = confidence interval, MI = myocardial infarction, PTGI = Posttraumatic Growth Inventory. Missing data on some variables means that not all column entries correspond to the group totals given at the top.

[a] Bootstrapped CI.

Table 3

Summary of Multiple Regression Analyses to Explain PTGI Scores

	PTGI total *N* = 76		Relating to others *N* = 74		New possibilities *N* = 74		Personal strength *N* = 74		Spiritual change *N* = 75		Appreciation of life *N* = 75	
Predictor	Coefficient (SE)	*β*	Coefficient (SE)	*β*	Coefficient (SE)	*β*	Coefficient (SE)	*β*	Coefficient (SE)[a]	*β*	Coefficient (SE)[a]	*β*
ABI (vs MI)	8.75 (6.82)	.20	5.43 (2.59)	.32*	1.51 (1.96)	.12	1.03 (1.59)	.11	.87 (1.22)	.13	1.45 (1.28)	.16
Age in years	-.09 (.24)	-.06	.02 (.09)	.04	-.02 (.07)	-.05	-.04 (.06)	-.11	.05 (.04)	.19	.01 (.05)	.02
Male (vs female)	3.10 (5.73)	.07	1.16 (2.17)	.06	1.23 (1.65)	.09	.25 (1.33)	.02	-.75 (.92)	-.11	-1.33 (1.65)	-.14
In a relationship (vs not)	14.89 (7.62)	.23	9.34 (2.84)	.38**	1.91 (2.15)	.11	1.87 (1.74)	.13	-.02 (1.14)	-.002	2.76 (1.40)	.21
Years since injury	.71 (.34)	.25*	.26 (.13)	.24	.27 (.10)	.33**	.11 (.08)	.17	.04 (.06)	.09	.08 (.07)	.13

Overall health[b]	2.03 (1.91)	.14	.06 (.71)	.01	.74 (.54)	.18	.81 (.44)	.25	.22 (.38)	.11	.50 (.36)	.17
R^2	.13		.20		.16		.11		.05		.09	
F	1.76		2.85*		2.13		1.35		.53		1.12	

Note. ABI = acquired brain injury, MI = myocardial infarction, PTGI = Posttraumatic Growth Inventory, SE = standard error.

[a] Bootstrapped SE.

[b] Health was rated in comparison to before the injury, with 0 = a lot worse, 1 = a bit worse, 2 = about the same, 3 = a bit better and 4 = a lot better.

* $p < .05$. ** $p < .01$.

Appendix

Illustrative Quotes for Themes Expressed in Open-ended Comments

'Relating to others' (PTGI factor). Participants from both samples noted changes in their relationships with others, including people in similar situations:

> "My brain injury has made me a better and stronger person, I … don't take anything or anybody for granted. I have a lot of compassion and understanding for others and appreciate people's help I need."
>
> - ABI sample, ID86

> "… I feel able to help others who've been through this experience and want to do that."
>
> - MI sample, ID57

'New possibilities' (PTGI factor). Several participants mentioned new opportunities from which they had benefited:

> "Since I have had my brain injury I have been to college and I am now in my 4th year doing a diploma in accountancy which I would never ha[ve] considered before my injury."
>
> - ABI sample, ID12

> "I went back to work but I was offered possibility [of] early retirement at age 55. I was then able to take on part time … admin of a charity which offered travel and a wide range of different activities and challenges."
>
> - MI sample, ID25

'Personal strength' (PTGI factor). This theme manifested in comments about acceptance and self-confidence:

"One day, I finally realized that I was still me, just a different version. After that epiphany, my life got much better. Accepting that I was different was the biggest hurdle."

- ABI sample, ID3

"Immediately after the heart attack my confidence and self belief dipped but is now stronger than before…"

- MI sample, ID57

'Appreciation of life' (PTGI factor). Several participants commented on changed priorities and appreciating each day:

"… [I]t prioritises things. I always thought it was my job to provide (money) for family and now realise being with my family is more important to them than what I can provide (money, shoes etc.)."

- ABI sample, ID87

"I plan for tomorrow, but live for today!!"

- MI sample, ID25

'Optimism/Positive attitude'. This theme was expressed by several participants but was not directly captured by the PTGI factors:

"I appreciate that many medical professionals approach advice about outcomes with a hopeful and positive perspective and this helped me to be positive, not to see limits but possibility of improvement … I know how I think/respond to my situation REALLY makes a difference."

- ABI sample, ID54

"Initially after heart attack the trauma is almost unbearable at times, but with time and following a properly organised cardiac rehabilitation programme, and without a

further event, life begins to become more focused on everything that is positive rather than negative."

- MI sample, ID70

'Emotional/Behavioural changes'. Although the PTGI 'Relating to others' factor includes willingness to express emotions, some participants noted additional emotional or behavioural changes:

"I believe I've become a more open personality."

- ABI sample, ID15

"Confrontation and harassment made me feel ill and shaky, so I made much greater efforts to resolve issues which had a potential for conflict."

- MI sample, ID65

'Lifestyle improvements'. This theme was only expressed by MI survivors, several of whom noted that their illness was a catalyst for health-related behaviour change:

"Having my heart attack has turned into a huge positive in my life from day to day. I decided while in hospital to crack on and not to feel down about my then poor health. I now exercise 7 days a week, and also my eating habits have changed - all part of a healthy lifestyle."

MI sample, ID64